Bench Manual

INSTRUCTION MANUAL

POLY-COMM "B"

For 12.6 volts DC and 117 volts AC operation

FOR OPERATION IN ANY CRAFT OR VEHICLE IN THE FREQUENCY RANGE OF 27.39 to 35.980 MC/s

FCC TYPE ACCEPTED FOR RULES PART 10 AND RULES PART II

FREQUENCY MODULATION (PHASE MODULATED) MONITORING FACILITIES

ILLUMINATED CALL LETTER PLACQUE SELECTIVE CALLING FACILITIES

POLY BOOSTER FACILITIES

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MANUAL NO: B-1

CODE NO: 1M631010

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WARRANTY

The Company warrants the equipment to be free from defects in workmanship and material under normal and proper use and service for the uses and purposes for which it is designed, and agrees to repair or replace at the place of manufacture, without charge, all parts thereof showing such defects which are returned for inspection to the Company's factory, transportation prepaid, within a period of ninety (90) days from date of delivery, provided that such inspection discloses to the satisfaction of the Company that the defects are as claimed, and provided also, that the equipment has not been altered, repaired, subjected to misuse, negligence or accident, or damaged by lightning, excessive current or otherwise, or had its serial number or any part thereof altered, defaced, or removed. Tubes, vibrators, fuses, crystals, diodes, transistors and pilot lamps shall be deemed to be covered by the manufacturers' standard warranty applicable thereto, and such items shall be, and are, hereby excluded from the provisions of this warranty.

The Company warrants that all of the items of equipment that are of the Companys' own manufacture will meet the technical specifications of the Standards of Good Engineering Practices, as established by the Federal Communications Commission. As to all items of equipment that are not manufactured by the Company, it is understood that the standard warranty of the manufacturer or supplier thereof shall be the only warranty applicalbe to such equipment.

Except as herein specifically provided, no warranty, expressed or implied, other than that of title, shall apply to any equipment sold hereunder. In no event shall the Company be liable for damages by reason of the failure of the equipment to function properly or for any consequential damages.

CHANGES

The Company reserves the right to modify or change the equipment, in whole or in part, at any time prior to delivery thereof, in order to include therein electric or mechanical refinements deemed appropriate by the Company, but without incurring any liability to modify or change any equipment previously delivered, or to supply new equipment in accordance with earlier specifications.

NOTE: No merchandise will be accepted for warranty service without prior written factory authorization.

SOME GENERAL FCC REGULATIONS

These rule sections are intended to serve as a guide only, and should not be construed as exact reproductions of pertinent paragraphs. Although they are representative of the current regulations, the Polytronics Laboratories, Inc., does not guarantee their continuing accuracy, as the FCC Rules and Regulations are changed and revised periodically.

1. The current authorization for each mobile station shall be retained but need not be posted. A transmitter Identifications Card (FCC Form 452-C) must, however, be attached to each mobile transmitter. The licensee will enter the following information on the card:

   Name of licensee
   Station call sign
   Exact location of transmitter records
   Frequency or frequencies of transmitter operation
   Signature of licensee or his designated official

2. The current authorization for each base (or controlling station shall be posted at the principal control point.

3. The licensee may use, at his discretion, a substitute plate of metal in place of the Identification Card (FCC Form 452-C). The plate will be entitled "Radio Transmitter Identification", and shall clearly display all the information required by Form 452-C except the signature.

GENERAL DESCRIPTION

The Poly-Comm "B" is designed for general mobile, marine or base station operation. Poly-Comms are readily adapted to temporary field work and may also be used in 14 V. aircraft. (Total system weight - 14 3/4 lbs.)

RECEIVER SECTION

The Poly-Comm B receiver is designed to receive phase modulated signals (FM) in the 27.29 to 35.98 MC business band.

The standard unit is designed for use in adjacent channel areas. A total of 9 tuned 2nd IF circuits provide at least 60 db attenuation to the adjacent channels and well over 85 db attenuation to alternate channels. Units incorporating a crystal filter in the first IF will have an adjacent channel attenuation in excess of 100 db.

The PC-B also contains circuitry which provides for the addition of a selective squelch circuit adaptor called a "Poly Call", which can be set to awaken the unit only when called by another unit which transmits the required alerting tone signal. A built in holding relay in the Poly Call adaptor keeps the message lamp lighted to indicate that a call was received while the unit was unattended.

TRANSMITTER SECTION

The Poly-Comm series transmitters are designed to transmit phase modulated signals in the 27.29 to 35.98 MC business band.

The Poly-Comm transmitter is a crystal controlled unit consisting of an rf oscillator, frequency multipliers, driver amplifier, and final power amplifier. The microphone amplifier, modulation limiter, deviation control amplifier, and audio filter comprise the audio modulating section.

A harmonic filter is included in the transmitter to attenuate all unwanted spurious signals below the FCC limit in effect at the time of manufacture. Selection of the proper filter is determined by the operating frequency and installed at the factory at the time of manufacture.

All alignment adjustments are accessible from either the top or bottom of the chassis. Changing frequency from the high to the low end of the band only requires the resetting of some transformer taps. Setting the transmitter on the assigned frequency is accomplished by the adjustment of the trimmer capacitor provided for this purpose. The transmitter is normally supplied with $\pm$ .002% crystals thereby eliminating the need for ovens.

CONSTRUCTION

The Poly-Comm is constructed on a rectangular chassis with the larger parts such as tubes and transformers mounted on top while the smaller wired components are located underneath.

The addition of a universal mounting bracket permits the mounting of the unit in any one of four positions.

CONNECTIONS

Connections to the unit are made via two connectors located on the lower rear wall. Either 117 VAC or 12.6 VDC may be applied to the 10 pin male plug. The antenna connection is made to the standard UHF female connector. An eight pin octal test/accessory socket is provided on top of the chassis directly behind the access door.

ALIGNMENT

All in the field alignment adjustments are accessible through access holes in the case. All special alignment adjustments are accessible from the top and bottom of the chassis after removing the chassis from the case. The PA plate, antenna matching and receive antenna adjustments are accessible through the holes provided in the case. The carrier indicator bulb can also serve as a tune-up indicator, thus permitting on-the-spot matching toany particular antenna.

EXPECTED RANGE AND PERFORMANCE

The Poly-Comm is comprised of a highly sensitive receiver (less than $\frac{1}{4}$ of a millionth of a volt at the antenna will provide one watt of audio output to the speaker), and a transmitter whose efficiency is better than 60% yields at least 10.0 watts of carrier to the antenna. (Average 12.2 watts)

In spite of the excellent specifications, the final system performance of the Poly-Comm depends soley upon the installation and operation techniques employed thereafter.

WHAT THE POLY-COMM WILL DO

Two Poly-Comms at ground level with indoor antennas will provide communications up to about 1 mile. Elevating one or both units will increase this range greatly. Operation from the top of a tall building will extend the range to the line of sight horizon (up to 20 miles).

Operation in an aircarft will, of course, give enormous horizon-to-horizon coverage.

Two Poly-Comms properly installed and operated in two vehicles will provide communications up to at least 20 miles in open flat terrain. The range will be considerably greater (25 miles and up) between two boats or a boat and car when the car is at the water's edge or at a high elevation.

In a mobile to base station arrangement, two properly installed Poly-Comms will provide communications between a car and a base station (whose antenna height is at least 50 ft. above ground) for at least 30 miles in open flat terrain.

The same ranges hold true when using the Poly-Call Adaptor selective squelch.

The Poly-Call Adaptor tone operated squelch IS a selective device and when used will cause the receiver to be immune to all noise, carriers, signals, diathermy etc. Upon receiving an on-channel carrier that contains the proper initiating tone, the receiver speaker will awaken, the message light shall become lighted and any accessories properly connected to the rear terminals shall become activated.

WHAT THE POLY-COMM WILL NOT DO

The Poly-Comm will not provide 100% reliable telephone type service at every or all locations. There will always be dead spots and weak signal areas. Mountains, tunnels, tall buildings, etc., will often act as shields and require the mobile station to move to a clear or higher elevation to re-establish contact.

The Poly-Comm is NOT a high fidelity unit. On the contrary, the frequency response (highs and lows) have been tailored to provide maximum intelligibility under high noise conditions like high road and wind noise at 60 MPH, outborad engines and sea noises, etc.

The Poly-Comm contains a squelch circuit which mutes the receiver during the absence of a signal and thus eliminates the annoying hiss, static and atmospheric noise which would be heard on the channel when not in use. The normal squelch circuit is NOT a device for removing noise from the signal being received, but will silence the receiver when no one is talking. Since the business band is shared among many services, other stations may be received. The normal squelch is NOT a selective device and will awaken the receiver during the reception of any on-channel signal. A loud buzzing or rasping noise is usually caused by a diathermy machine and is usually intermittent in nature.

At the present state of the art, it is practically impossible to completely eliminate ignition noise from weak signals. Very sensitive and selective receivers are prone to pick up ignition noise. The limiters in the Poly-Comm are highly effective in minimizing the tic-tic-tic noise created by the firing of the spark plugs. However, the spark coils used in high compression V8's, especially Ford and Mercury, produce some interference, in which case the various filtering techniques of section 5 should be employed.

It is felt that the advantages of a highly sensitive receiver yielding maximum useable range with some ignition noise outweighs the disadvantages of the short range insensitive receiver that appears free from ignition noise.

SPECIFICATIONS:

Useful Operating Range:	
Mobile to Mobile:	Guaranteed 20 miles minimum in open flat terrain
Base to Mobile:	Guaranteed 30 miles minimum in open flat terrain when base station antenna elevation is 100 ft. or more.
Receiver: (Dual conversion superheterodyne)	
Sensitivity:	Better than 0.25 uv for 20 db quieting or by the SINAD method, at 1000 CPS at ±5 KC deviation.
Readability:	Better than .08 uv at 1000 CPS at ±5 KC deviation.
Selectivity:	6 db bandwidth: 12 KC or greater
Standard Filter:	60 db bandwidth: 32 KC or less adjacent channel rejection 60 db or more.
Crystal Filter:	60 db bandwidth: 30 KC or less 100 db bandwidth: 40 KC or less. Adjacent channel rejection: 100 db or more.
Modulation Acceptance:	±5 KC or more
Frequency Stability:	±.002% (-30°C. to +60°C.)
Crystal Range:	33.29 to 41.98 MC
Crystal Trim Range:	±.01% (approx. ±3 KC)
Number of Channels:	One
Squelch Sensitivity: (adjustable)	At threshold, receiver will awaken for carriers of .1 uv or greater. At stop receiver will awaken for carriers of 7.5 uv or greater. (Stop limit adjustable from 1 to 20 uv)
Squelch Immunity:	Squelch will not clip during reception of carriers deviating up to ±6 KC at any setting. Ignition noise will not awaken the receiver.
Audio Output:	At least 2.0 watts into 4" PM weatherproof speaker at 1000 CPS at ±5 KC deviation.

Frequency response:	Within +2 to -3 db of a 6 db per octave, de-emphasis curve from 300 to 2400 CPS. (12KC ref.)
Hum and Noise:	Better than 40 db down from 1 watt unsquelched. Better than 50 db down from 1 watt squelched.
Direct image:	Better than 70 db down
Indirect Image:	Better than 85 db down (standard filter). Better than 100 db down (crystal filter.)
Spurious Responses:	All better than 60 db from measured sensitivity.
Intermodulation attenuation:	At least 60 db down on adjacent Channels.
Desensitization:	Better than 60 db down on adjacent channels.
IF Frequencies:	6.0 MC and 455 KC
Compliance:	Meets current FCC Rules Part 15 re: Incidental Radiation Device.
Duty Cycle:	Continuous.
TRANSMITTER: (Phase Modulated)	
FCC File Number:	Polytronics type B-1 (type accepted)
FCC Emission Designation:	20 F3
FCC Listing:	Radio equipments list Part C. Viewable at FCC field offices only.
Plate Power input to final:	18W
Power output to antenna:	at least 10 watts
Output impedance:	51 ohms nominal, accomodates 35 to 75 ohms.

Spurious emmission attenuation:	Spurious emissions occurring within ± 10 to ± 20 KC of the assigned carrier frequency are attenuated at least 25 db Spurious emissions occurring within ± 20 to ± 50 KC are attenuated at least 35 db. Spurious emissions occurring on frequencies removed from the assigned frequency by more than ± 50 KC are attenuated at least 53.7 db ($43 + 10 \log_{10} P_C$)
Crystal Multiplication:	Sixteen times.
Frequency stability:	± .002% (-30°C. to +60°C.)
Frequency Trim range:	± .01% (approx. ± 3KC)
Crystal Range:	1.705 to 2.248 MC
Number of Channels:	One
Modulation:	±5KC deviation for 100% modulation at 1000 CPS.
Modulation adjustment range:	Continuous from 0 to ± 18 KC deviation.
Modulation limiting:	Instantaneous and automatic. Limits at ceramic microphone output level of 30 millivolts or more at 1000 CPS.
Audio Response:	Within +1 to -3 db of a 6 db per octave, pre-emphasis curve from 300 to 2400 CPS. Ref. = 1.2 KC
Audio Roll Off:	Low-pass filter attenuates audio at a rate greater than $40 \log_{10}(F/3)$ db at 3KC and above. Attenuation at 15 KC is at least 28 db down. Ref. = 1 KC.
Distortion:	Less than 10% at ± 3½ KC deviation @1000 CPS
Hum and Noise on Carrier:	At least 40 db below ± 5 KC deviation @1000 CPS.
Duty cycle:	1 minute on, 4 minutes off

SYSTEM SPECIFICATIONS:

Audio Response:	Within +3 db from 300 to 2400 CPS (Ref 1.2 KC)
Humidity:	Will perform after being subjected to 90°C at 95% relative humidity for 8 hours.
Vibration:	Will withstand 10G shake from 60 to 1800 cpm for 30 minutes in three planes
Shock:	Will withstand 15G shock in 3 planes.
Switching:	Push-to-talk 4PDT relay (plug-in type)
Supply Voltage Variations:	-20 to +10% of rated input voltage.
AC Power Consumption:	75 watts, receive, 120 watts transmit
DC Power Consumption:	10 amps on 12 volts transmit, 6 amps receive.
Size:	11"W x 7½D x 5"H
Weight:	14 3/4 lbs total system weight
Color:	White, case, black grill, gold escutcheon, black knobs.
Microphone:	Ceramic, freq. response 200-4000 cps. nickel plated brass, press-to-talk switch, hang-up clip on front, connector and retractable coil cord.

TUBE COMPLEMENT

6CB6	RF amp
12AT7	1st mix/osc
6BJ6	6 MC IF amp
6BH6	1st lim
6BH6	2nd lim
12AX7	1st aud/sq
6GW8	(½) audio out
6GW8	(½) mic pre-amp
6BL8	(½) dev. control amp
12AT7	osc/phase mod
6BL8	(½) doubler
6EJ7	quadrupler
6EJ7	doubler
7551	final
6BN6	detector

SEMI-CONDUCTORS

(2) HD6226	noise rectifiers
(1) IN751A	zener modulation limiter
(2) BY100	diodes, full wave doublers
(2) 2N1588	transistor (trans. power supply only)

CRYSTAL INFORMATION

Both the transmit and receive crystal are of the HC 6/U type (.093 Dia. pins spaced .484) and have a tolerance of ±.002%. The receive crystal is a 3rd mode overtone type that oscillates 6 MC above the assigned channel between 27.39 and 43.00 MC. On assigned channels above 43.00 MC the receiver oscillator operates 6 MC below the assigned channel.

The transmit crystal is of the fundamental type, and oscillates at one sixteenth of the assigned channel frequency. The correlation capacity of the transmit oscillator is approximately 22 UUF.

UNPACKING AND EQUIPMENT SUPPLIED

Besides this manual, the box contains:

( ) Poly-Comm "B"

( ) Microphone with coil cord and connector

( ) Microphone hang-up clip

- ( ) 2 self-tapping #8 philips head screws
- ( ) 2 6-32 x 1" MSBH
- ( ) 2 #6 LWIT
- ( ) 2 #6 x ¼ nuts

( ) Universal mounting bracket

( ) 3 knurled 10 - 32 x ¼ thumb screws

( ) 5 #8 3/4 hex head self-tapping screws

( ) AC line cord with two 2 amp fuses

( ) DC line cord with 1 14 amp fuse

( ) Final electrical test data sheet

( ) License application Form 400

( ) Transmitter Identification Card 452-C

Other antennas and accessories are supplied with instruction packing lists templates in their own respective cartons.

INSTALLATION

A. INSTALLATION IN A CRAFT OR VEHICLE

When installing the Poly-Comm in a craft or vehicle, the components listed below must be mounted in the vehicle.

Universal mounting bracket
DC line cord with in-line fuse
Poly-Comm
Antenna assembly and transmission line
Gutter hook (optional)
Microphone hang-up bracket
Ignition suppressor (and generator filter if needed)

Before installation is begun, the location for each part should be carefully studied, as a thorough, well-planned installation contributes considerably to the performance of the equipment and to the ease of maintenance. The installation kit contains all necessary parts for a complete installation.

The Poly-Comm is designed to operate as specified in this instruction manual. DO NOT SUBSTITUTE PARTS IN THE INSTALLATION OF THIS EQUIPMENT OR CONNECT ANY OTHER COMPONENT OR EQUIPMENT TO THE POLY-COMM WITHOUT FIRST CONSULTING WITH POLYTRONICS LABORATORIES, INC.

The components of the system should be located out of the way, yet convenient for operation and maintenance. Plan the cables so that they will not be stepped on or catch in the hand brake, gear shift or other operating controls.

1. MOUNTING THE UNIT IN A VEHICLE

Examine the six ways of mounting the unit to the universal mounting bracket as shown in Fig. 1, and choose the one that will afford the best compromise between ease of operation, appearance, and serviceability. If possible, pick a location where the unit will not catch on stockings or skin knee caps. Leave enough room for detaching the rear cable connectors. The universal mounting bracket contains many punched holes which may align with holes already existing in the bottom of the dashboard. While the mounting bracket has been designed to mount in about 90% of the vehicles currently on the road, extra dashboard accessories and a desire for a custom appearing installation may require new holes to be drilled.

Avoid locations that will interfere with glove compartments, doors, ashtrays, etc. For appearance sake it is usually preferred to position the bracket so the front edge of the Poly-Comm will be even with the edge or contour of the dashboard.

Using the mounting bracket as a template, locate 3 or more mounting screw positions. Drill #30 pilot holes and secure the bracket to the mounting surface with #8 self-tapping screws supplied.

Ascertain that the Poly-Comm is turned off and install the DC line cord on the rear of the unit and lightly thread two knurled screws into the sides of the unit. Slide the unit into the mounting bracket. Tighten both knurled screws.

Avoid lead interference and cut the unfused lead to the appropriate length and connect to the nearest good chassis ground.

Cut the fused lead to the appropriate length and connect to the ACC terminal of the ignition switch (or fuse panel). Connecting the unit directly to a continuous Hot "A" would make it possible to forget to turn off the unit before leaving the vehicle, and could result in a run-down battery. Using the ignition switch to turn the unit off and on is highly recommended since the unit is automatically placed in service whenever the vehicle is operated and prevents unauthorized operation when the keys are in the owner's possession.

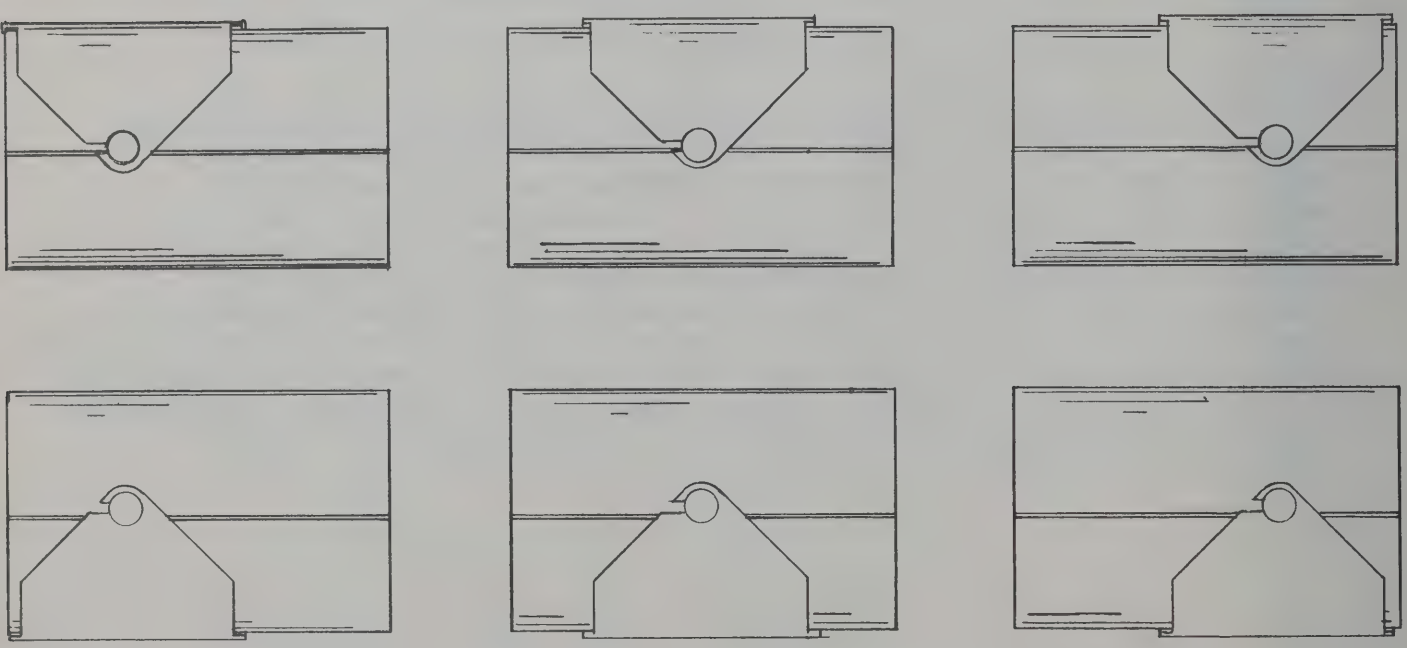


Figure 1

2. MOUNTING THE UNIT IN A BOAT

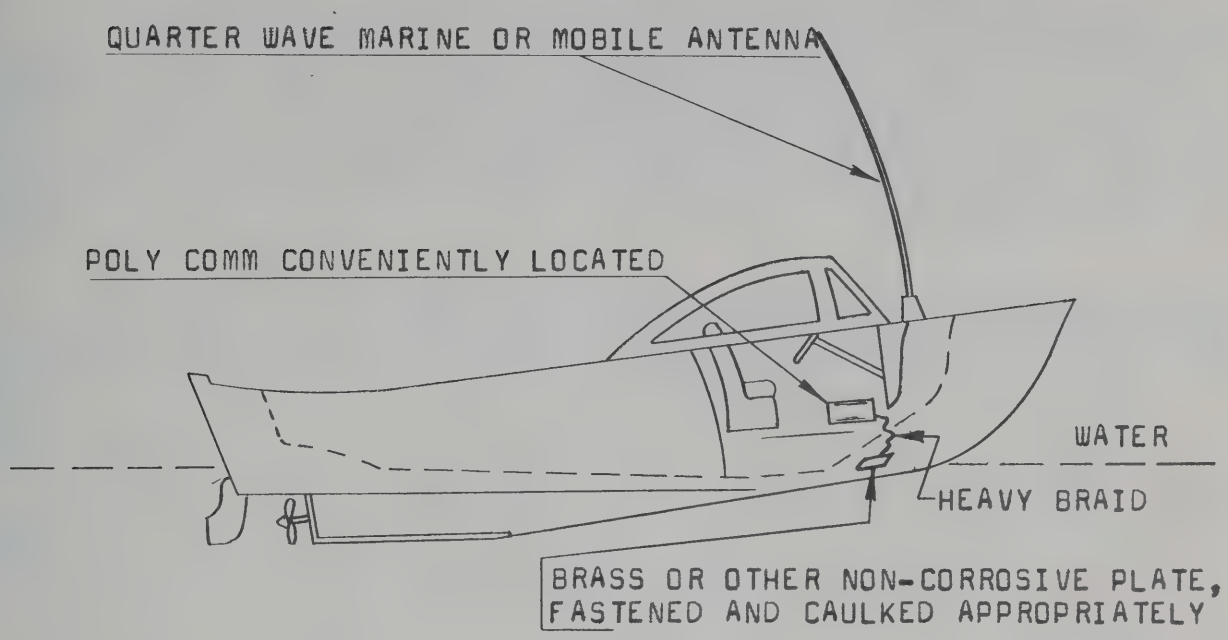


Figure 3

Braid should be silver soldered to brass bolt passing through plate and bulk head. Bolt should be silver soldered to plate. All screws and bolts used to secure plate must also be silver soldered to plate to prevent deterioration due to electrolysis.

The universal mounting bracket may be fastened to any flat surface such as an inner cabin roof, behind deck chairs, or on a bulkhead. The Poly-Comm will operate in any position, but locations where spray or rain is likely to reach the unit should be avoided. The #8 self-tapping screws supplied are pointed and will thread into wood as well as metal. Secure the bracket in the desired location using at least 4 screws.

3. MICROPHONE

The package containing the microphone also includes the microphone hanger and 2 mounting screws. The case of the Poly-Comm contains a cluster of holes on each side to facilitate the mounting of the microphone hanger in either of 2 positions. See Fig. 2. Mounting the hanger on the case is recommended whenever the unit is to be used for temporary communications at various locations or if additional holes in the dashboard are to be avoided.

For convenience it is desirable to position the hanger somewhere on the dashboard within easy reach of the operator where the microphone may be grasped without the operator having to take his eyes off the road.

Frequently the hanger is fastened to an ashtray or some other replaceable item which can be renewed prior to trading in the vehicle.

If holes are to be added, use the hanger as a template and locate centers for 2 #31 holes.

In any event, mount the hanger securely in position and place the microphone on the hanger. Remember to avoid locations where the microphone cord is likely to catch on objects. Adjust the inner spring by bending with long nose pliers for the desired microphone holding tension.

ALTERNATE MICROPHONE HANG-UP CLIP LOCATIONS

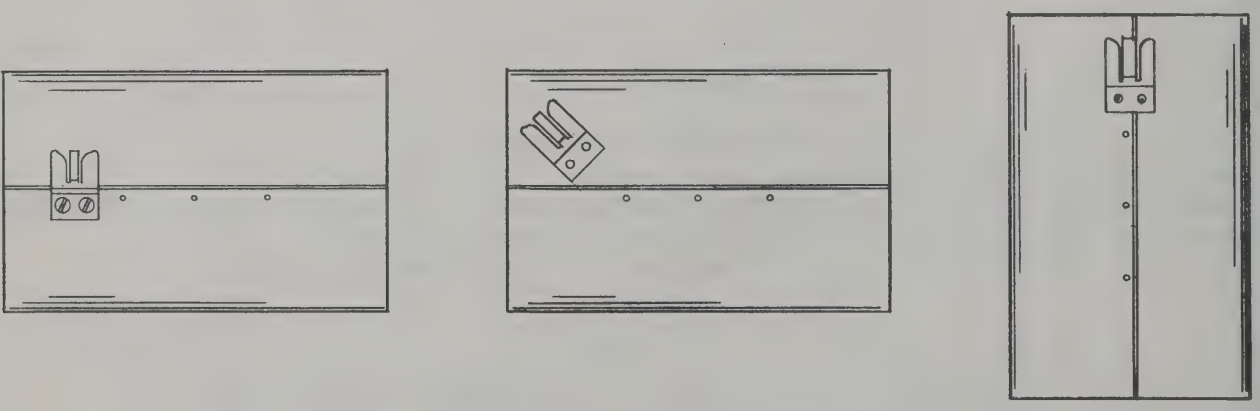


Fig. 2

4. ANTENNA ASSEMBLY

Study the mounting details supplied with the particular type antenna to be installed. Choose a relatively flat area of the craft or vehicle body for installation. The normal location for the antenna in a typical sedan is at the left rear corner of the body. In this position the radiation pattern is somewhat more pronounced in the direction of the front right corner due to the

mass of the vehicle. On boats, the ¼ wave mobile antenna can be installed successfully in the center of the top of the cabin. Tin foil or copper plate should then be installed (can be stapled) on the underside base in order to simulate a ground plane. On shallow draft or open top boats, the indoor antenna may be conveniently used or a mobile antenna may be installed on the inside of the boat as close to the unit as possible and a ground plate fastened on the outside of the craft below the water line. See Figure 3.

In any case and particularly where truck bodies are involved, the antenna should be mounted as high as possible consistent with overhead obstruction normally encountered and should not be closely parallel to vertical metal portions of the craft or vehicle.

Frequently the antenna base is mounted on gas cap covers and back-up light plates in order to preserve the trade-in value of the car. Replacema bumper guards may also be used.

The length of the antenna is dependent upon the frequency of operation. For best results use the chart below to determine the proper length from the body of the craft or vehicle at the antenna mount to the top of the antenna whip. (including the antenna spring if used)

27.30 to 27.49	117 inches
30.00 to 33.50	98 inches
33.50 to 37.00	92 inches
37.00 to 40.50	86 inches
40.50 to 44.00	80 inches
44.00 to 49.90	74 inches

(a) Universal Antenna Mount

Use the template supplied with the antenna and drill the appropriate holes and mount accordingly. To provide a firm ground for the antenna shield, scrape clean the area around the hole where the grounding ring will bear against the metal body. Be sure to plan the hole locations so that the antenna spring may be swiveled to vertically position the whip.

Screw the whip into the antenna.

(b) Antenna Clip

An antenna clip is supplied with each full length antenna mount to hold down the antenna when the vehicle is to be driven into a garage or under a low overhead obstruction. The clip is designed to be attached to the rain gutter or equivalent over the front door of the vehicle.

After the antenna has been installed in the antenna spring and mount, pull it down to a point just over the front door. Locate the clip so that the antenna will fit under the top band of the clip with the end ball just forward of it. Check to be sure that the door will open with the antenna held in position.

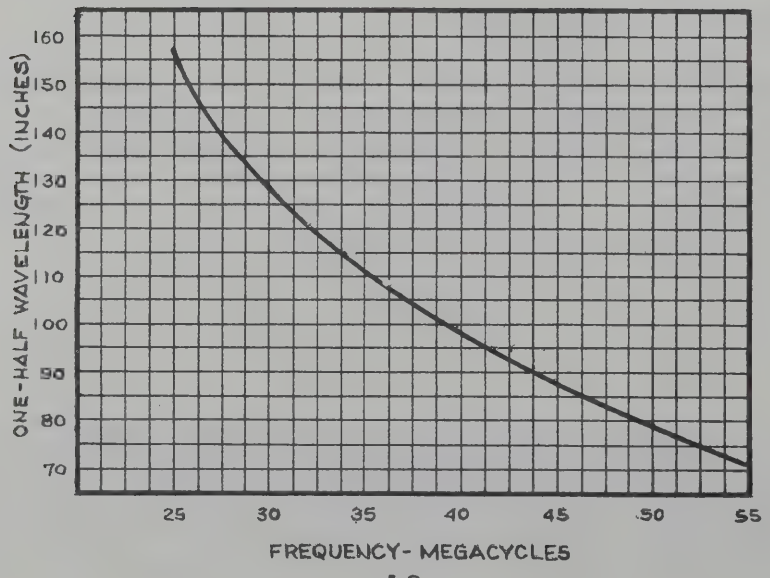
Using the clip as a template, drill a #30 hole and fasten with a #8 x $\frac{1}{4}$ self-tapping screw from the installation kit.

(c) Antenna Cable

For best results in a craft or vehicle, the RG58/U 50 ohm coaxial transmission line should be cut to the length shown in the table, or multiples thereof and other lengths, but will probably require precise impedance matching at both the antenna and at the unit, and may result in a slight sacrifice in performance.

If the antenna is located within 18 inches of the unit, the transmission line may be omitted and stranded #16 insulated wire can be connected between the center terminal of the antenna base and the center pin of the coax connector supplied. In such instances, the case of the Poly-Comm connects directly, via heavy braid, to the nearest good vehicular ground in the case of a car. On boats the case is to be connected directly to a fari size ground plate fastened to the outside of the boat below the water line.

Since base station antennas usually have an impedance of 72 ohms or 51 ohms, any length of the appropriate transmission line may be used.



When using the transmission line, prepare as follows:

1. Wire the UHF connector to one end of the transmission line coaxial cable. The parts are provided in the installation kit.

2. Snake the free end of the cable through whatever holes, compartments, etc., are required in order to reach the antenna base.

3. Remove 2 inches of the vinylite jacket and $\frac{1}{4}$ inch of the braid shield and inner conductor insulation. Tin the center conductor and solder to the lug supplied with the antenna mount.

4. Loosen the shield braid from the dielectric and slide it back toward the vinylite jacket.

5. Separate the individual strands of the shield with a pick or other pointed instrument and gather them to one side of the cable so that a pigtail may be formed and soldered directly to the ground lug on the antenna mount.

6. Place the center conductor terminal lug over the center stud of the antenna mount. Tighten the nut to hold the lug securely.

After connecting the transmission line to the antenna mount, wind any excess line into a neat coil not less than 8 inches in diameter. Connect the line to the Poly-Comm and dress the cable safely out of the way of tools, luggage and people.

(d) Antenna Matching

The Poly-Comm may be matched to any 36, 50 or 72 ohm antenna by adjusting C6. This capacitor is accessible via a hole in the top of the case. The antenna loading capacitor, C7, is accessible through a bottom hole in the case approximately below the top hole. A technician possessing a valid 1st or 2nd class radio-telephone operator's license can peak up the Poly-Comm by adjusting C6 for maximum RF output as indicated by maximum brilliance of the front panel indicator bulb while pressing the microphone button. The loading capacitor is also adjusted in a similar manner. The peak of the loading capacitor is broader than the peak obtained by tuning C6. Both adjustments interact and should be tuned alternately for maximum reading. Approximately 12 watts into a 51 or 72 ohm resistive antenna is normal. The Poly-Comm is normally supplied tuned to a 51 ohm load, but should be "touched up" during installation.

5. NOISE SUPPRESSION

A normally operating Poly-Comm will produce a rushing sound when unsquelched. This shot-noise is a result of random electron bombardment of the elements within the vacuum tubes in the front end of the receiver. The high gain of the unit amplifies this noise, thus yielding the characteristic rush associated with all good receivers. As long as the Radio Frequency Amplifier stage smplifies the received signal enough to overcome this noise, then the sensitivity of the unit will be good. A normal receiver has a sensitivity better than .25 uv for 20 db of quieting.

The shot noise also serve to saturate the limiters and yields a reference level for the squelch circuit. Without this necessary shot noise, the remarkable Poly-Comm specifications would not be possible.

A unit with low gain and no noise would yield psychologically pleasant operating conditions, but would be poor in range, squelch operation, and immunity to ignition noise.

At the present state of the art, it is impossible to produce a .25 uv receiver with good-overall performance without the presence of shot noise on weak signals. Therefore, this noise is intentional and beneficial and should not be confused with the noise picked up by the antenna system which can usually be minimized if not eliminated.

The Poly-Call circuit (when used) is intended to eliminate the annoying squelch openings that might otherwise occur during diathermy reception, skip conditions and continual channel use in highly populated areas.

Many present day vehicles are factory equipped with resistor type spark plugs or resistance high tension leads which minimize the need for additional noise suppression components.

After the Poly-Comm has been placed in operation and tested, the installation should be analyzed for noise pickup. This check should be made while receiving a very weak signal so that the normal receiver noise is reduced to a very low value, but not quite eliminated. If any ignition noise is present, it will then be noticed as a "popping" effect against the receiver noise in the background. If noise is present and is originating in the ignition or generating system, it would disappear when the engine is turned off. If this is the case, any one or combination of the following remedies should provide a cure. Apply singly to discover which is causing the trouble, although all may be necessary in stubborn cases.

(a) Remove the center high tension lead from the distributor and plug the suppressor into the distributor. Insert the high tension wire into the suppressor. (In some cases it may be necessary to install suppressors at each of the spark plugs.)

(b) Frequently a severe source of interference is the generator which produces a whining and frying sound. Usually such noise will cause the receiver to awaken when the engine speed is increased and can frequently be reduced by connecting a .5 uf 50 to 200 volt generator capacitor from the generator output (armature) terminal to ground. Do <u>not</u> connect to generator field terminal. Such a capacitor can be obtained from any auto store or from your auto dealer.

Generator noise may make it appear that the squelch circuit is defective when actually a generator filter coil is required. If a commercial generator filter * is unavailable, such a filter can be easily made by close winding 9 turns of #14 enamel wire on a 1" diameter form. Strip tin and form each end into a closed loop. Remove all leads from the armature terminal (large bolt) on the generator and connect one end firmly to this terminal. Use a nut, bolt, 2 flat washers and a lock washer of appropriate size to fasten together all remaining loose ends plus the end of the .5 uf generator capacitor. Position the self-supporting coil in the clear and parallel to the generator.

*Morrow type CC-10
Cesco Model 330
Lafayette CF-135

(c) Connect another capacitor to the hot side of the ammeter, the ignition switch, or the ignition coil. Further ignition noise problems may require bonding as follows:

Hood to the firewall or install grounding wipers around the hood periphery.
Tailpipe to the body (not the chassis) at the rear of the vehicle.
Some or all of the metallic cable jackets between the engine and driver's compartment. Do this at the engine side of the firewall.

Other noise sources and their remedies are as follows:

Voltage regulator noise - connect a .01 uf ceramic disc capacitor in series with a 100 ohm, 1 watt composition resistor between the field terminal and ground. Install these components inside the regulator cover if possible.

Tire static - use an innter-tube powder as recommended by the individual car manufacturer.
Electrically controlled gauge noise (gas, oil, temperature, etc.) - cut the lead as close to the acutation element as possible and install a Sprague Type 48P18 hypass capacitor. Be sure the capacitor case is well bonded to the body or engine block of the car.

B. INSTALLATION INSTRUCTIONS FOR OPERATION FROM AC MAINS

The Poly-Comm may be operated from the AC mains by connecting the fused AC line cord between the unit and any 117 V. AC convenience outlet. The Poly-Comm may be operated on a desk or shelf or out in the open using extension cords. Do not connect to a DC power main.

An indoor antenna such as the Antenna Specialists ASP63 and a right angle coaxial adaptor permits the erection of a self-supporting resonant 1/4 wave vertical antenna at the rear of the Poly-Comm.

For normal range, a ground plane or coaxial sleeve antenna as recommended.

Mounting and installation instructions are included with each such antenna.

If possible, the antenna should be installed as high and in the clear as possible.

Any length of either 72 ohm or 50 ohm coaxial transmission line may be used depending on the antenna. Prepare and install the line as described in the vehicular installation instructions.

OPERATING THE POLY-COMM B

A. Obtaining a license

Accompanying each Poly-Comm is an FCC citizens band application Form #400. This Form must be filled out carefully and accurately in complete accordance with the instructions given in the Form. Using the Worksheet and having another person check your information will help prevent unnecessary delays incurred by having the application returned due to errors or omissions. A valid license must be in the licensee's possession before any transmitter can be operated.

If the applicant contemplates operating several transmitters such as a fleet of delivery trucks, only one application is required to be submitted. The applicant must then state the total number of transmitters in the system. It is legal and customary to state a higher number of transmitters and thus avoid license modification, changes, etc., at a later date if more transmitters are added to the system. It is legal to be licensed for 20 units and actually operate 10 or so, but is definitely illegal to operate more units than is called for on the license.

B. Assignment of Call Letters

The call letters assigned to each station or system is assigned in alphabetical (district wise) and numerical order and special numbering requests will not be honored.

C. Operating Procedure

Upon receipt of a valid citizens band station license, the licensee must post the license at the main control (fixed) station location, then fill out and attach a 452C transmitter identification card to each unit (as described previously).

If only mobile or craft operated units are to be used, a photocopy of the original license (plus the 452C ID card) can be carried in the "master" station. The original must be retained at the location so stated on the ID cards.

It is best for technical as well as personal reasons, to abide by the FCC request for SHORT TRANSMISSIONS. Learn to say a lot with a little and everyone concerned will be grateful. AVOID WINDBAG'ISM.

Once the station or system is licensed anyone may speak over it and use it for any purpose not contrary to FCC rules and regulations Part 10 and Part 11, provided the station or system is under control and supervision of the licensee.

A plate is provided on the front panel whereupon the station call letters can be printed with a dark #2 pencil. This plate is illuminated when the unit is turned on.

When a licensed system contains several cars, boats, or planes, etc., it is common to designate the control station by the assigned call letters and arbitrarily assign numbers (or names to each unit, i.e., car 1 callingKDB844 --------car 1 to car 7, ------- KDB844 to KDI334-------- etc.

It is not necessary to give the call letters every single time, actually it is more feasible to give the calls upon establishing initial contact and then occasionally thereafter. The channel is intended for useful communication, not just giving call signs.

It is customary, however, to announce that the station is entering or leaving radio service. Most dispatchers will find it advantageous to arrange some signalling system as the "10-code."

D. National "10-Codes"

GENERAL PROCEDURE

10-1 Receiving poorly
10-2 Signals good
10-3 Stop transmitting channel in use by others
10-4 OK--affirmative-message received
10-5 Relay message
10-6 Operator busy, stand by
10-7 Out of service
10-8 In service--subject to call
10-9 Repeat transmission poor reception
10-10 Transmission completed, subject to call (standing by)
10-11 Speaking too rapidly
10-12 Officials or visitors present
10-13 Advise road and weather conditions
10-14 Correct time
10-15 Make a pickup of...at...
10-16 Have picked up or have in possession
10-17 Urgent (business)
10-18 Anything for us
10-19 Nothing for you. Return to station
10-20 What is your location?
10-21 Call me by landline
10-22 Report in person to...
10-23 Stand by
10-24 Finished with last assignment
10-25 Do you have contact with
10-26 Disregard last information
10-27 Moving to channel....

EMERGENCY OR UNUSUAL

10-30 Does not confirm to rules and regulations
10-33 Emergency traffic at this station
10-34 Trouble at this station, help needed
10-35 Confidential information
10-36 Accident at ....
10-37 Wrecker needed at ....
10-38 Ambulance needed at....
10-39 Convoy or escort

CIVIL DEFENSE OF NET MESSAGE HANDLING

10-60 What is your message no.
10-61 Continuous Wave (CW)traf.
10-62 Teletype traffic
10-63 Any answer net directed
10-64 Message for local delivery
10-65 Net message assignment
10-66 Cancellation
10-67 Clear for net message
10-68 Dispatch information

FOR FIRE AND FORESTRY

10-70 Fire
10-79 Report progress of fire

TECHNICAL

10-91 Too weak, talk closer to mic
10-92 Too loud, talk farther from mic
10-93 Frequency check
10-94 Give a test: J1 with voice J2 without voice (carrier)

E. ACTUAL OPERATION

The Receiver

1. Connect unit to power source as described under Installation procedure.

2. Connect properly matched antenna to antenna connector.

3. Connect microphone (receiver will not operate without microphone).

4. Place:

   (a) Power switch in OFF position.

   (b) Rotate volume control about 1/3 full clockwise setting.

   (c) Rotate squelch control to the extreme clockwise position.

5. Place the power switch in the "Rec only" position.

   (a) The call plate should glow softly.

   (b) The tubes should be seen glowing in the chassis through the ventilating holes.

6. As the unit warms up, the characteristic shot noise (rushing sound) of a high gain receiver should be heard. Adjust to comfortable level.

7. The receiver is now ready to operate.

   (a) Adjust the squelch control until the unit just silences when no signals are being received.

8. If during mobile operation the squelch threshold appears to shift CCW to the point where the squelch control does not silence the unit, this would indicate that the vehicle or the local area has a signal strength of at least 3 microvolts (the factory pre-set limit). If the vehicle ignition noise cannot be reduced, then the squelch limit control can be advanced.

   (a) Use a #6 Allen wrench and remove the squelch knob.

   (b) Adjust the outer shaft to 1/2 setting.

   (c) While racing the engine, insert a small bladed screw driver in the hollow shaft and adjust the inner control until the receiver just quiets.

   REMEMBER, THIS IS ONLY AN EXPEDIENT. THE VEHICLE SHOULD BE SUPPRESSED RATHER THAN DESENSITIZE THE RECEIVER.

   (d) Replace knob with index vertical at 1/2 setting.

MONITORING FACILITIES

A monitor speaker of 3.2 ohms can be connected to pins 3 and 8 to provide a distant monitoring position, say in a shop or remote office.

The monitor speaker is connected in parallel with the internal speaker and will be activated at the same time and under the same conditions.

The main volume control is used to set the volume of both the internal and remote speaker during reception.

POLY-CALL ADAPTOR (Separate Accessory)

Placing the function switch in the Poly-Call position will silence the receiver speaker as well as any monitor speaker if used.

The unit shall remain silent until activated by a tone signal of the correct frequency by a similar unit on the same channel.

The ten tone channels used in the Poly-Call are:

A 1625	F 2375
B 1775	G 2535
C 1925	H 2675
D 2075	I 2825
E 2225	J 2975

The tone frequency is determined by the plug-in filter accessible after removing the Poly-Call chassis from its' case. Each filter is stamped with a letter as above.

Only units with the same filter letter and operated on the same channel can activate each other when in Poly-Call operation.

While in Poly-Call a slight hissing or very weak audio sounds may be heard by placing the ear close to the unit. This is normal and is merely the iron cores of the audio transformer "singing" as they pass on the signals to the tone circuits.

When correctly called, a relay in the Poly-Call will close and cause the message light to become lighted and all speakers will awaken and remain so. The squelch and volume control then become activated. The volume at the remote monitor speaker is also determined by this control.

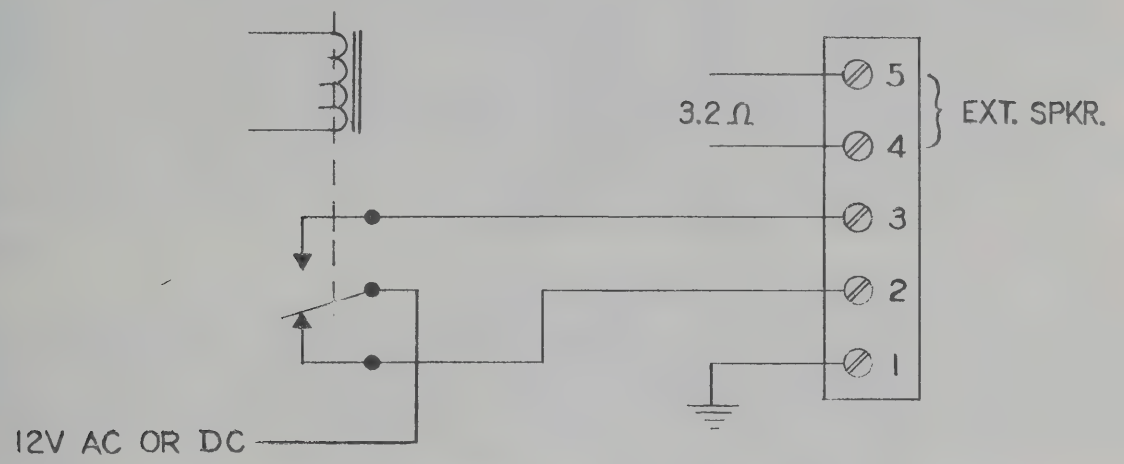
When the function switch is placed in the OFF position the message light is turned off and normal operation is resumed and the unit will receive all calls in the normal manner.

The tone frequencies have been chosen so as to prevent false awakening by heterodynes, speech or other signalling devices.

CONTROLLING ACCESSORIES

The Poly-Call circuitry may be used to control practically any device such as: car horn, lights, garage-door openers, sirens, auxiliary systems, electric coffee pots, remotely located TV boosters, etc.

The following is a simplified schematic showing the Poly-Call holding relay circuitry:



The message light cannot be re-arranged and will indicate whenever the relay is energized.

Once called, the relay will remain energized until re-set by placing the function switch in the OFF position.

Although the moon is 1/49th diameter of the earth, it is further away.

OPERATING THE TRANSMITTER

Prior to pressing the microphone button the following must be done:

1. A valid license shall be posted at the main control (fixed) station location.

2. A properly filled out and SIGNED mobile identification card, 452C, must be affixed to the unit.

3. Rules Part 10 or Part 11 must be obtained, read and understood.

Violators of any of the above are subject to severe penalties.

When the legal requirements have been met, anyone may operate the transmitter by pressing the microphone button, and anyone may speak into the microphone, provided, the supervision of the transmitter is still directly under the control of the licensee.

In order to place the transmitter on the air, proceed as follows:

1. Connect unit to proper voltage source.

2. Connect a properly matched antenna to the antenna connector.

3. Place the power switch in the Trans-Rec position.

4. Advance the volume control clockwise to about 1/3 setting.

5. Allow 30 seconds for the unit to warm up. Refer to Page 24 and adjust the receiver as desired.

6. After monitoring the channel to avoid impolite interruptions the unit is ready to transmit.

7. Pressing the mic button will:

   (a) Cause the transmitter to generate a carrier on the assigned channel.

   (b) Cause the "T" bulb to glow warmly. See Antenna Matching Page 19.

   (c) Place the transmitter on the air and silence the receiver. Reception is impossible while transmitting and likewise your signal cannot be heard by another station while they are transmitting. Each must take turns.

8. When speaking into the microphone best results will be obtained by holding the mic in the corner of the mouth and projecting the voice forward.

9. In order to activate any other units using the Poly-Call selective squelch it will be necessary to press the function switch into the RING position for at least 2 seconds.

   Only units with the same filter and on the same channel will be activated.

   It is not necessary to press the mic button simultaneously.

   The transmitter will operate with the function switch in either the Poly-Call or OFF position.

When the RING switch is pressed, the unit is actually transmitting a carrier which is tone modulated. While ringing the "T" bulb should glow.

When transmitting in the Poly-Call position, it will be necessary to have the receiver awakened by an alerting tone from another unit in order to hear the reply. The message light must be glowing in order to hear.

Operating the transmitter will not reset the Poly-Call.

The best method is to flip the function switch to the OFF position after ringing in order to prevent the possibility of not hearing a reply in the event the mating unit failed to ring prior to transmitting.

TRANSMITTING WHILE MOBILE

The aforementioned 9 steps also apply to mobile operation except that in spite of the fact that some states have laws requiring the operator of a vehicle to steer with one hand and signal with the other, the same state may also have a law prohibiting steering with one hand and holding the microphone with the other. When state law is in doubt, it is best to park while transmitting.

YAK-YAK

A little practice will show that it is not necessary to use worn-out phrases as "Roger, 10-4, Over, Break," etc., since the squelch circuit automatically gives a little "ssst" signifying the end of each transmission. Also remember to AVOID WINDBAG'ISM.

SERVICING

The Poly-Comm is supplied completely aligned, adjusted and tested and normally requires no attention in the field. Should a failure or tampering result in the need for service, the Poly-Comm should be serviced by a competent electronic repair agency. The law requires that the transmitter section be adjusted only by a service technician who possess a 1st or 2nd class radio-telephone operator's license.

TVI

The tuned circuits in the Poly-Comm serve to attenuate all spurious and harmonic signals to a value well below the FCC prescribed minimum. Should the Poly-Comm be received on nearby television, radio or other electronic devices, chances are that the fault lies at the receiver and can be cured by the addition of a high-pass filter to the unit picking up the signal. In any event a duly licensed station is not required to suspend, curtail, or in any way abstain from operating a normally functioning Poly-Comm unless so ordered to do so by the FCC. In all cases of interference, courteous cooperation usually results in a happy compromise. The Poly-Comm is type accepted and meets all current FCC requirements at the time of manufacture.

HEATING

The sturdy metal case serves to protect the Poly-Comm as well as to dissipate the heat generated within. It is normal for the case to run quite warm and no damage will be done since the unit is designed to operate up to 180°F. Avoid placing heat sensitive objects on or near the Poly-Comm.

(e) Similarly connect the VTVM to TP (V12) and peak the top slug of T8, then peak the bottom slug of T8.

(f) Similarly connect the VTVM to Pin 5 of the Test Socket and peak the top and bottom slugs of T9.

A. Removal of unit from case.

1. Remove microphone bracket from the side (if used).

2. Remove the two hex head screws at the rear and the single hex head screw on the bottom.

3. Tilt the case slightly and slide the unit out of the case.

B. Alignment

The Poly-Comm is supplied aligned and normally does not require alignment in the field. Tubes and parts may be replaced (with the exception of tuned circuits) without having to align the Poly-Comm.

This procedure is applicable for "touching up" a working receiver, changing frequency, or replacing receiver crystals.

In the event of receiver failure, it is best to apply trouble shooting techniques rather than attempt to cure the defective receiver by re-alignment.

(a) Operate the receiver in the usual manner.

(b) Connect a VTVM, set to the -1.5 volt range, to pin 2 of the test socket.

(c) Adjust L1 for maximum reading (approx. -1.2) then detune to approximately 70% of maximum reading by turning L1 counter-clockwise

(d) Adjust C9 to the center of its' range. C9 is located beneath the chassis at the socket for V4
Notch ½ Way Between Mounting Lugs

(e) Connect a VTVM, set to the -1.5 volt range to pin 5 of the test socket.

(f) Connect a signal generator, known to be on the assigned frequency (* 300 cycles) to the antenna connector.

(g) Make a Tuning Load consisting of a 4.7K resistor in series with a .01 uf capacitor. This tuning load must be used whenever T4, T5 or T6 are adjusted. Attempting to peak T4, T5 or T6 without using this "Tuning Load" will result in distorted reception, squelch clipping, decreased range.

(h) Connect the tuning load from T4 pin A to ground. Adjust the signal generator attenuator for a reading of about -1 volt, then adjust the top of T4 for maximum reading. Now connect the tuning load from T4 pin E to ground and tune the bottom slug for maximum.

(i) Similarly load T5 Pin A and peak the top of T5, load T5 Pin E and peak the bottom of T5.

(j) Remove load and peak T1, top and bottom of T2, standard filter, and T3.

(k) Connect the VTVM to Pin 7 of the Test Socket. Use the -1.5 volt scale.

(l) Connect the tuning load from T6 Pin A to ground. Advance the attenuator on the signal generator until the reading on the VTVM just starts to increase. Adjust the top slug of T6 for maximum meter reading.

(m) Similarly load T6 Pin E and peak the bottom of T6. Remove load.

(n) The quadrature coil L2 can be adjusted by either of 3 methods:

(1) With no signal applied, connect the vertical input of an oscilloscope to pin 1 of the Test Socket. Sweep at approximately a 2000 CPS rate and adjust L2 for a symetrical "grass" pattern (i.e. as much grass above the base line as below)

(2) With no signal applied adjust L2 for the loudest and cleanest rushing sound (shot noise)

(3) Apply a 1 uv signal, modulated with about a 1000 cycle tone and adjust L2 for the cleanest, clearest, loudest tone with minimum background noise.

(o) Apply a 3 uv, 1000 CPS tone modulated signal to the antenna connector. Remove the knob from the squelch control. Rotate the outer shaft fully counter clockwise. With a thin bladed screwdriver adjust the inner shaft control until the receiver just silences then back off until the receiver is firmly awake. After removing the signal, the threshold should occur at about 2/3 full CW setting.

(p) An adequately aligned receiver should have a sensitivity of better than .25 uv for 20 db quieting and a squelch threshold sensitivity of approximately .08 uv.

SYSTEM ALIGNMENT

All receivers are aligned to within ± 300 cycles of the assigned FCC channels prior to shipping and should operate in all properly maintained systems. Exact system alignment can be accomplished by adjusting C9 for the best sounding signal while receiving a weak signal on system frequency.

TRANSMITTER ALIGNMENT

This procedure is applicable for "touching up" a working transmitter or tuning up after replacement of transformers, changing frequency or replacing crystals.

In the event of transmitter failure or changing frequency, it is best to remove the 7551 transmitting tube while applying trouble shooting techniques or re-tuning earlier stages.

(a) Operate the transmitter in the usual manner by pressing the microphone button.

(b) Connect a 15 watt 51 ohm dummy load to the antenna connector.

(c) If the frequency is changed drastically, check that the transformer taps are correctly connected as directed on the schematic. The connections are determined according to the frequency range in which the transmitter is used.

(d) Connect a VTVM set to the -1.5V range to pin 2 of the Test Socket and while pressing the Mic button adjust L3 for maximum reading.

(e) Similarly connect the VTVM to TP (V12) and peak the top slug of T8. Then peak the bottom slugs of T9.

(f) Similarly connect the VTVM to Pin 5 of the Test Socket and peak the top and bottom slugs.

(g) Install the 7551 PA tube V14 and connect the VTVM to Pin 7 of the Test Socket and peak the top slug of T10.

(h) Observe the wattmeter and tune C6 and C7 for maximum RF output. A normal unit delivers about 12 watts.

(i) Use a frequency counter or equivalent and adjust C5 for exact assigned carrier frequency.

DEVIATION AND AUDIO LIMITING

While observing a suitable deviation indicator apply approximately 10 millivolts of a 1000 cycle sine wave to Pin 1 of the Mic jack with the Mic button pressed and a dummy load connected to the antenna connector.

Adjust the DEV control to produce a deviation of $\pm$5 KC.

In the absence of an audio oscillator, the tone may be approximated by whistling into the Mic.

TROUBLE SHOOTING

In order to facilitate trouble shooting, an alignment tube location chart, and voltage chart can be found on the rear of the schematic.

POLY-BOOSTER CONNECTION AND OPERATION

Any Poly-Booster can be used in conjunction with the Poly-Comm B. Follow the installation instructions accompanying the booster. Some boosters will require that a jumper be inserted between the two green terminals on the rear apron of the unit.

CAUTION: The booster jumper must be removed when connecting a signal generator to the antenna connector. Failure to do so will cause the filament voltage to be applied to the signal generator and possible resultant damage to the pad or attenuator.

In the event of trouble not covered herein, troubleshooting help may be obtained by writing to Polytronics Labs, 88 Clinton Road, West Caldwell, New Jersey to the attention of the Service Manager, or calling prepaid, (201) 228-2400 person-to-person to the Poly-Comm "B" Service Manager. Whether writing or calling, be sure to state serial number, model number, schematic issue letter (A, B, C, D, etc.) and be prepared to give a complete list of symptoms.

On May 6, 1963, the Federal Communications Commission via Docket No. 14507 adopted a fee schedule for its licensing and regulatory activities, requiring that all license applications submitted after January 1, 1964, be accompanied by a check or money order in the full amount of the fee required. Only applications accompanied by the correct fee will be processed. The Commission will not be responsible for cash sent through the mails. Payments should be in the form of a check or money order payable to the Federal Communications Commission. Receipts will be furnished upon request in the case of payments made in person, but no receipts will be sent for payments sent through the mails. All fees will be charged irrespective of the Commission's disposition of the application. Applications returned to the applicant for additional information or corrections will not require an additional fee when resubmitted. Refunds will be made only in the case of payments in excess of the required fee.

SCHEDULE OF FEES

A. No Fee Services

No fee is required for filing applications in the police, fire, forestry-conservation, highway maintenance, local governments and state guard radio services.

Fees are not required for applications file in the special emergency radio service or by hospitals, disaster relief organizations, beach patrols, school buses, non-profit ambulance operators, rescue organizations or by Governmental entities.

B. Schedule of Fees

Applications for new license for which Form 400 is prescribed	$10.00
Applications for renewal of license only for which FCC Form 405-A is prescribed	$ 4.00

This means that all applicants applying for station license using Form No. 400 must submit a remittance in the amount of $10.00. If operation is intended in any of the following services, the $10.00 operation fee is required.

Power radio service
Petroleum radio service
Forest products radio service (not to be confused with Forestry-Conservation radio service)
Motion Picture radio service
Relay Press radio service
Special Industrial radio service
Business radio service
Manufacturers radio service
Telephone Maintenance radio service.

Since the rules of the FCC are constantly changing, please refer to the latest pertinent sections of Rules Part Nos. 10.69, 10.70, 11.67 and 11.68.